

REMARKS

By the above amendment, a new dependent claim 10 has been presented reciting the feature that the ultrasound probe is an intracavitary ultrasound probe.

The rejection of claims 1 - 8 under 35 USC 102(b) as being anticipated by Nix et al (US 7,037,269B2) and the rejection of claim 9 under 35 USC 103(a) as being unpatentable over Nix et al in view of Holdaway et al (US 2001/0047134A1), such rejections are traversed, and reconsideration and withdrawal of the rejections are respectfully requested.

As to the requirements to support a rejection under 35 USC 102, reference is made to the decision of In re Robertson, 49 USPQ 2d 1949 (Fed. Cir. 1999), wherein the court pointed out that anticipation under 35 USC §102 requires that each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference. As noted by the court, if the prior art reference does not expressly set forth a particular element of the claim, that reference still may anticipate if the element is "inherent" in its disclosure. To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." Moreover, the court pointed out that inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.

In accordance with the present invention, as recited in independent claim 1, the only independent claim in this application, an ultrasound probe as illustrated in Figs. 1 and 2 of the drawings of this application, for example, includes a plurality of transducers as represented by the transducer unit 1 and a flexible circuit board 2

having slits 3, as illustrated in Fig. 2, which divides signal lines of the circuit board into sections, as illustrated in Figs. 1 and 2, so that each section of the flexible circuit board divided by the splits 3 is spirally wound, as more clearly illustrated in Fig. 1 of the drawings of this application, for example. Thus, as illustrated in Figs. 1 and 2 and recited in claim 1 and the dependent claims, the flexible circuit board is comprised of at least two sections or channels which extend from the transducers in a longitudinal direction, and each section of the flexible circuit board divided by the slits is spirally wound. As described in the specification of this application, the ultrasound probe of the present invention is configured so as to enable observation of an internal body part such as an esophageal wall, an intestinal wall, and the like, representing a tubular organ from inside by inserting the probe inside the human body. During the observation, a flexible section of the probe is bent into a complicated shape corresponding to that of the tubular organ being examined, while receiving a strong force. By dividing the flexible circuit board into plural sections by way of the slits, the force is divided among the plural sections, thereby reducing unnecessary distortion caused by the force. In case of inserting the probe inside the human body through a mouth or anus, a flexible section is bent in one direction at for example one point, and is bent in an opposite direction at another point. If the probe is constructed with a single flexible circuit board, the distance between the one point and the other point has to be sufficient long because the width of the flexible circuit is large. In contradistinction, if the probe is configured with a plural number of sections of the flexible circuit board, the width of the individual flexible circuit board becomes small, and it becomes possible to shorten the distance between the one point and the another point, and thereby cope with the complicated shape of the tubular organ. Furthermore, when a probe is connected to a transducer array mounted on a distal

end of a catheter, for example, the ultrasound probe which is an intracavitary ultrasound probe, requires many channels of transducer elements. Thus, many signal lines are required and by dividing the signal lines into plural sections representing plural circuit boards in the manner disclosed and claimed in this application, the construction of the probe is simplified. In this regard, applicants note that Figs. 4(a) - 4(d) respectively show a probe, in accordance with this invention, formed respectively of 2-5 sections of flexible circuit board. Applicants submit that such features as recited in claim 1 and the dependent claims are not disclosed or taught in the cited art, as will become clear from the following discussion.

Turning to Nix et al, irrespective of the contention by the Examiner that Nix et al teach “wherein the flexible circuit board has slits the flexible circuit board must have areas of non-conduction in order to separate the different signal lines dividing signal lines into sections at each of said positions at a predetermined angle and each section of the flexible circuit board divided by the splits is spirally wound (col. 4, lines 32 - 34)” (emphasis added), applicants submit that Nix et al only discloses single flexible circuit board without slits, representing a single flexible circuit board 12, as illustrated in Fig. 2, which is helically or spirally wound, in the manner disclosed. Irrespective of the contentions of the Examiner, applicants submit that Nix et al provides no disclosure or teaching of a flexible circuit board having slits dividing signal lines of the flexible circuit board into sections so that plural sections of the flexible circuit board are provided, in the manner recited in claim 1 and the dependent claims of this application, resulting in the advantageous construction as described above. Thus, in accordance with the present invention, the divided signal lines are provided on the different sections of the flexible circuit board divided by the slits, and contrary to the position set forth by the Examiner, Nix et al provides no

disclosure or teaching of the recited features of claim 1 in the sense of 35 USC 102 or 35 USC 103. Accordingly, applicants submit that claim 1 and the dependent claims patentably distinguish over Nix et al and should be considered allowable thereover.

With respect to the dependent claims, claim 2 recites the feature that a member is provided around each spirally wound section of the flexible circuit board, and again, this feature is not disclosed or taught by Nix et al. Claims 3 - 9 depend from claim 2 and irrespective of the contentions by the Examiner, recite further features of the present invention, recognizing that Nix et al fails to provide a flexible circuit board divided by slits so as to provide plural sections of the flexible circuit board in the manner defined. Thus, all claims patentably distinguish over Nix et al in the sense of 35 USC 102 and 35 USC 103 and should be considered allowable thereover.

With respect to claim 9, whether or not Holdaway et al discloses or teaches separate layers for a ground and signal, applicants submit that Holdaway et al fails to overcome the deficiency of Nix et al with respect to a flexible circuit board having slits dividing the flexible circuit board and signal lines thereof into sections so that essentially a plurality of flexible circuit boards which are spirally wound are provided. Thus, applicants submit that the features of claim 9 also patentably distinguish over this proposed combination of references.

With respect to newly added claim 10 which depends from claim 1, applicants submit that features of claim 10 when considered in conjunction with claim 1 further patentably distinguish over the cited art and should be considered allowable at this time.

In view of the above amendments and remarks, applicants submit that all claims present in this application patentably distinguish over the cited art and should now be in condition for allowance. Accordingly, issuance of an action of favorable nature is courteously solicited.

Also submitted herewith is an Information Disclosure Statement and consideration of the documents is requested.

To the extent necessary, applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to the deposit account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (Case: 529.44217X00), and please credit any excess fees to such deposit account.

Respectfully submitted,

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